DR-50. SYNTHESIS OF Co^{2+} DOPED ZnO–CdS COMPOSITE NANOPOWDER AND ITS ENHANCED PHOTOCATALYTIC PERFORMANCE UNDER VISIBLE LIGHT IRRADIATION

G. Thirumala Rao[1], R. V. S. S. N. Ravikumar[2],
N. Bakthavatchala Reddy[3], G. V. Zyryanov[3, 4]

[1] Physics Division, Department of Basic Sciences & Humanities, GMR Institute of Technology, Rajam, Andhra Pradesh, 532127, India

[2] Department of Physics, Acharya Nagarjuna University, Nagarjuna Nagar, Andhra Pradesh, 522510, India

[3] Ural Federal University of the first President of Russia B. N. Yeltsin, Mira St., 19, Yekaterinburg, 620002, Russia

[4] I. Ya. Postovsky Institute of Organic Synthesis UB RAS, S. Kovalevskoy/Akademicheskaya St., 20/22, Yekaterinburg, 620990, Russia

E-mail: thirumalaphy@gmail.com

Synthetic dyes and colored organic compound are the major pollutants which exists mainly in waste water at large quantity. These hazardous pollutants posing a great nuisance to the surroundings due to their carcinogenic and toxic effects. In order to reduce their impact on the environment, the conventional methods like ultrafiltration, coagulation and biodegradation have been used. However, the effect of these conventional methods is very limited because of highly expansive, consumption of chemicals and release of secondary organic particles. Photocatalysis has been considered as one of the most promising method for the complete degradation of organic pollutants without generation of secondary particles. Nanoparticles are more efficient in removal of organic pollutants. TiO_2 and ZnO were considered to be an efficient materials for removal of organic pollutants from waste water. However, the photocatalytic performance of these oxides was hindered because of their wide bandgap energy and fast recombination of charge carriers. Further research focused towards enhancing the efficiency of the photocatalyst via doping, composites or hybrid materials. The recent scenario in this field signifies the importance of sensitizing materials for an advanced photocatalytic applications. One of the ways to improve the energy efficiency of the photocatalyst is by making composite nanostructures, i. e. by combining wide bandgap ZnO with a narrow bandgap sensitizer like CdS, CdSe and CdTe. Among these, higher attention was paid to CdS due to its well matched crystal structure with ZnO, in addition to its visible sensitization and good catalytic nature. A wide variety of ZnO-CdS nanocomposite photocatalytic materials in different shapes and structures were examined in the recent past. The increasing demand in the development of novel materials for effective photocatalysis motivated the researchers towards advancements in semiconductor photocatalysis.

The recent studies revealed that transition metal ions doped nano structures can be used for photocatalytic applications. This motivated us to develop novel materials based on ZnO-CdS nanocomposites for advanced photocatalysis by doping transition metal ions. In present investigation, Co^{2+} doped ZnO-CdS nanocomposite photocatalyst was prepared by chemical precipitation method and characterized by XRD, SEM with EDS, TEM and FT-IR. The photocatalytic efficiency of Co^{2+} doped ZnO-CdS nanocomposite on the photo degradation of methylene blue dye have been examined and a plausible mechanism for the synergetic photocatalysis has been discussed in detail.